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*Indian Standard*  
**TEST CODE FOR ANIMAL CARTS**

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

**Gr 3**

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# Indian Standard

## TEST CODE FOR ANIMAL CARTS

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**AMENDMENT NO. 1 MAY 2002**  
**TO**  
**IS 12161 : 1987 TEST CODE FOR ANIMAL CARTS**

( *Page 4, clause 2.3* ) — Substitute the following for the existing:

**'2.3 Wheel Skid** — Wheel skid shall be defined from the following formula:

$$\text{Wheel skid, percent} = \frac{100 (N_1 - N_2)}{N_1}$$

where

$N_1$  = number of revolutions of wheel for a given distance at no load, and

$N_2$  = number of revolutions of wheel for a given distance under load.'

( *Page 4, clause 2.4* ) — Delete.

( *Page 4, clause 4.1* ) — Substitute the following for the existing:

**'4.1 Laboratory and Track Tests** — Following tests shall be conducted in the laboratory and on the track, as the case may be.'

( *Page 6, clause 4.1.3.5* ) — Substitute the following for the existing:

**'4.1.3.5** For measurements of pull, a direct reading/recording type hydraulic dynamometer or strain-gauge dynamometer may be inserted in the pull line of the cart. Use of telescopic yoke bar for fitting the dynamometer during the test should be preferred. The dynamometer shall have an accuracy of 1 percent, Min.'

( *Page 6, clause 4.1.3.6* ) — Delete.

( *Page 6, clause 4.1.3.7, line 1* ) — Substitute 'skid' for 'slip'.

( *Page 6, clause 4.1.3.7, line 4* ) — Delete the word 'drive' .

( *Page 6, clause 4.1.3.8, sentence 2* ) — Substitute the following for the existing sentence:

**'Loading of the cart shall be done in steps of 0.1 tonne ranging from 25 percent of designed capacity.'**

( *Page 6, clause 4.1.3.10, Note* ) — Delete.

**Amend No. 1 to IS 12161 : 1987**

[ *Page 7, clause 4.2.1(a)* ] — Substitute the following for the existing text.

'a) Stability of cart (on level and slope of 6 to 8 percent);'

( *Page 10, Appendix B, column heading 9* ) — Substitute 'Relative Humidity, %' for 'Pressure, kPa'.

( *Page 10, Appendix B, column heading 10* ) — Delete and renumber subsequent column.

( FAD 59 )

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Reprography Unit, BIS, New Delhi, India



# *Indian Standard*

## TEST CODE FOR ANIMAL CARTS

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Bureau of Indian Standards on 31 July 1987, after the draft finalized by the Farm Transport Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

**0.2** The animal cart is still the major means of transporting goods between village to village and between village and town. It also serves as passenger transport in rural areas. These carts are available in various designs and shapes to suit specific requirements of terrain and topography of the area as well as according to the size of the animals. A need was felt to prepare a test code to evaluate animal carts on a uniform basis.

**0.3** In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

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### 1. SCOPE

**1.1** This standard provides guidelines for evaluation of the performance of animal carts.

### 2. TERMINOLOGY

**2.0** For the purpose of this standard, following definitions shall apply.

**2.1 Unladen Mass of Cart** — The mass of empty cart without any load, operator and animal.

**2.2 Laden Mass of Cart** — The mass of cart with loaded material including 75 kg for the mass of the operator but without the mass of animals.

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\*Rules for rounding off numerical values (*revised*).

**2.3 Wheel Slippage** — Wheel slippage shall be defined from the following formula:

$$\text{Wheel slip, percent} = \frac{100 (N_1 - N_0)}{N_1}$$

where

$N_1$  = number of revolutions of the driving wheels for a given distance under load, and

$N_0$  = number of revolutions of the driving wheels for the same distance at no load.

**2.4 Maximum Sustained Pull** — The pull where limiting factor of wheel slippage of 15 percent in case of pneumatic wheels and 7 percent in case of wooden/steel wheels or pulling limitation of recommended animals is achieved.

### 3. SELECTION OF SAMPLE FOR TESTS

**3.1** The animal cart shall be selected at random from the series production by the representative of the testing station with the consent of the manufacturer. It would be the responsibility of the manufacturer to ascertain that the cart selected for testing is complete in all respects and necessary adjustments have been carried out in the presence of the representative of the testing authority.

**3.2 Specification and Other Literature** — The manufacturer shall supply all literature, operation manual and a detailed drawing. The manufacturer shall also supply a specification sheet duly filled as per proforma given in Appendix A. Any other information required for conducting the test should also be supplied by the manufacturer.

### 4. TESTS

**4.1 Laboratory and Track Tests** — Following tests shall be conducted in the laboratory as well as on the track.

**4.1.1 Checking of Specifications** — The specifications supplied by the manufacturer ( see 3.2 ) shall be checked and reported.

**4.1.2 Chemical composition of material of wheel axle** shall be checked and reported.

#### 4.1.3 Drawbar Test

**4.1.3.1 Test track** — The drawbar test shall be conducted on bitumen, macadam or off-the-road-land terrain of 500 metres length run. The

track should be level avoiding gradients. The degree of surface unevenness in the test track in a 3 m stretch should not exceed 8 mm for bituminous surface, 12 mm for macadam surface and 25 mm for off-the-road-land terrain surface. The type of test track shall be stated in the report.

**4.1.3.2** Following details of animals used in conducting the test shall be reported ( *see also* Fig. 1 ).

- a) Number,
- b) Breed,
- c) Whether zebu or non-zebu,
- d) Whether fitted with shoe,
- e) Height ( cm ),
- f) Length ( cm ),
- g) Paunch girth ( cm ),
- h) Chest girth ( cm ),
- j) Body depth ( cm ), and
- k) Mass ( kg ).

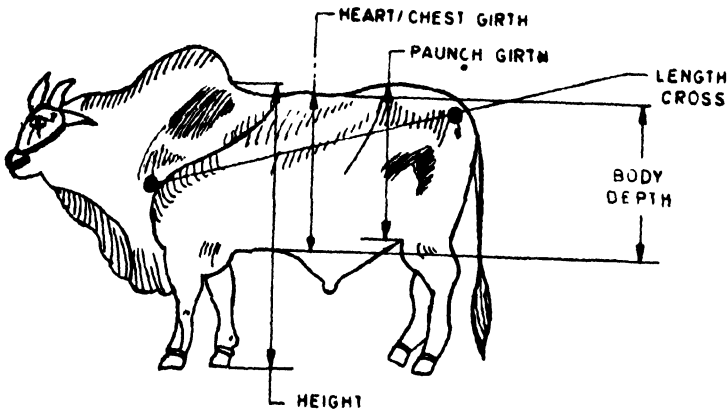


FIG. 1 TYPICAL DRAWING OF ANIMAL INDICATING VARIOUS DIMENSIONS .

**4.1.3.3** The optimum height of hitching of yoke shall be selected by the testing authority in consultation with the manufacturer and reported.

**4.1.3.4** Horizontal component of the line of pull ( draft ) shall be calculated by measuring the angle which the line of pull makes with the horizontal, with the help of following formula:

$$D = P \cos \theta$$

where

$D$  = draft ( kN ),

$P$  = pull ( kN ), and

$\theta$  = angle between the line of pull and the horizontal.

**4.1.3.5** For measurement of pull, a direct reading type spring or hydraulic dynamometer or strain-gauge indicator may be inserted in the pull line of the cart. Use of telescopic yoke bar for fitting the dynamometer during test would be preferred.

**4.1.3.6** In case of pneumatic wheeled carts, the height of tread bars shall be not less than 65 percent of the bars of the tyre when new. The measurement of height of tread bars shall be made at the central line of the tyres, the cart standing on a firm level surface.

**4.1.3.7** The measurement of pull, speed and slip shall be started only after the operational conditions are stabilized. Reporting shall be made with reference to speed, mass of cart and its mass distribution, type of track, height of yoke, wheel size and inflation pressure of drive wheels ( in case of pneumatic wheels ).

**4.1.3.8** Measurement of pull, speed and slip shall be made for the unladen cart and then for the laden cart on the track specified in **4.1.3.1**. Loading of cart shall be done in steps of 0.5 tonnes ranging from 25 percent of designed capacity up to wheel slip of 15 percent for pneumatic wheel, of wheel slip of 7 percent for wooden/steel wheels, or limitation of pulling capacity of animals used, whichever occurs first.

**4.1.3.9** The test for each load shall be repeated 5 times.

**4.1.3.10** Test report shall include presentation of following curves:

- a) Laden mass of cart as a function of pull,
- b) Forward speed as a function of pull, and
- c) Wheel slip as a function of pull.

**NOTE** — Maximum sustained pull at maximum laden mass of cart shall be reported.

**4.1.3.11** Measurement during drawbar test shall be recorded in a data sheet as per proforma given in Appendix B.

**4.2 Haulage Test** — At least 3 tests, each of minimum 3 hours duration shall be conducted by hauling recommended pay load on earthen and tar macadam track having short gradient up to 6 percent. Test may be conducted with at least two different types of loading material:

- a) Solid material, such as sand or grain filled bags; and
- b) Bulky material, such as grain and fodder crop or straw/bhusa, etc.

**4.2.1** Besides measurement of average speed for haulage, observations shall be recorded on following parameters:

- a) Stability of cart ( on level and slope );
- b) Turning ability;
- c) Comfort to pulling animals;
- d) Comfort to operator; and
- e) Safety provision in case of overturning, etc.

## **A P P E N D I X   A**

*( Clause 3.2 )*

### **DATA SHEET FOR ANIMAL CARTS**

#### **1. General**

- a) Name
- b) Type ( two wheeled/four wheeled )
- c) Make
- d) Model
- e) Serial number
- f) Name and address of manufacturer

**2. Type and Number of Animal to be Used**

**3. Loading Capacity**

- a) In mass, kg
- b) In volume, m<sup>3</sup>

**4. Radius of Turning Circle**

**5. Radius of Turning Space**

**6. Details of Components**

**6.1 *Wheel Equipment***

a) *Wheel*

- i) Type ( wooden or wooden with steel ring on top or metallic or pneumatic or any other )
- ii) Number and size ( face width and diameter )
- iii) Material details
- iv) Number and type of spokes, if applicable
- v) Method of fitting to axle
- vi) Recommended tyre pressure, kPa, if applicable

b) *Bearing*

- i) Number and type
- ii) Location
- iii) Method and frequency of lubrication

c) *Axle*

- i) Type
- ii) Number and size
- iii) Material of construction

d) *Brake*

- i) Type
- ii) Constructional details
- iii) Method of operation

- e) *Track Width*, mm

## **6.2 *Frame and Platform***

- a) Material and details of construction and size of chassis
- b) Material and details of construction and size of loading platform
- c) Material and details of construction and size of side support

## **6.3 *Yoke-Bar***

- a) Type and material of construction
- b) Size and details of construction
- c) Number of holes for attachment with yoke
- d) Diameter of hole and hole to hole distance

## **6.4 *Yoke***

- a) Type and material of construction
- b) Size and details of construction
- c) Provision of fixing to the neck of animal

## **7. Safety Features Incorporated in the Cart**

## **8. Dimensions**

- a) Overall length; cm
- b) Overall width, cm
- c) Overall height, cm

## **9. Unladen Mass**

## APPENDIX B

(Clause 4.1.3.11)

## DATA SHEET FOR DRAWBAR PERFORMANCE OF ANIMAL CARTS

Sl. No.	UNLADEN CART, t	BALLAST LOAD IN CART, t	LADEN CART, t	TRAVEL SPEED, km/h	CORRESPONDING PULL, kN	DRIVE WHEEL SLIPPAGE, PERCENT	ATMOSPHERIC CONDITIONS		MAXIMUM SUSTAINED PULL, kN	LIMITING FACTOR
							Temperature °C	Pressure, kPa		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)



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